COMPARISION OF STOCKING DENSITY FOR NEREIS DIVERSICOLOR UNDER CULTURAL AND NATURAL (ANZALI LAGONA) CONDITIONS

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POREĐENJE GUSTINE NASDA *NEREIS DIVERSICOLOR* U PRIRODNIM I UZGOJNIM (ANZALI LAGONA) USLOVIMA

Abstract

Nereis diversicolor is regarded as a live food and is significantly effective in increasing stocks, enhancing tolerance in sturgeons and also increasing survival of sturgeon fry. Research conducted indicates that *N. diversicolor* is more abundant in May as compared to other months of the year. In February, only breeders of this species are found in the environment. *N. diversicolor* was found in four different weight classes from March 2009 to February 2010. They showed decrease in density with increase in temperature and reached the lowest numbers in February. In years 2009 and 2010, 200 sampling conducted monthly at the point where Caspian Sea mixes with the Anzali lagoon. Sampling was performed by Van Veen sampler with 400 cm^2 cross section. Sediments were washed through a sieve with 0.5 mm mesh size. The residue along with *Nereis* was transferred to a dish, worms separated and transferred to lab. The density of worms per m^2 was calculated according to the density formula. Two experiments were conducted to determine the best stocking density for the culture of *N. diversicolor.* Stocking density of 381-6350 worms m^{-2} were used in 6 trials initially and best growth was recorded in trial with density of 381 worms m^{-2}. In the second experiment using 381-3175 worms m^{-2} in 7 trials, trial with 381 worms m^{-2} again showed better growth as compared to other trials. These results obtained were almost similar to those obtained for *N. diversicolor* is in its natural environment (447 worms m^{-2}).

Key words: *Density, Nereis diversicolor, Anzali lagoon, Caspian Sea*

INTRODUCTION

Nereis diversicolor belongs to the phylum Annelida, class ploychaeta and plays an important role in the nutrition of commercially valuable fishes like sturgeons. Considering the distribution of this worm in the Sea of Azov that served as a feed for sturgeons inhabiting this sea (Nikolsky, 1963) Russian scientists transferred about 65000 of this benthic organism from the Sea of Azov to the Caspian Sea during 1939-1941 to increase the food resources of sturgeons in this sea. In 1948 they had spread through an area more than 30,000 Km^2 particularly in the western part of the Caspian Sea (Clark, 1989).

As a result of the introduction of benthic organisms including *N. diversicolor*, *A. stellatus* began to feed on this (Holcik, 1989) and thus nereis and abra constituted the basic food for this species. *A. gueldenstaedtii* also usually feed on *N. diversicolor* and abra (Kazenchev, 1971). According to Holcik (1989) in October 12.3 % of the stomach contents of *A. gueldenstaedtii* was reported to be composed of *Nereis*. *N. diversicolor* is widely developed in sediments with high organic content where they feed on organic matter. Juvenile and adult worms can survive easily in salinities of 1 ‰. These worms live for up to one year and die after breeding. They are also capable of tolerating oxygen deficits for relatively long periods (Zenkenvitch, 1963). Zenkenvitch (1963) reports that 66 % of dry weight in nereis is made up of protein, 7.73 % fat and 13.83 % ash. *N. diversicolor* has a nutritive value of 5.58 kilo calorie g^{-1}.

MATERIAL AND METHODS

Sampling stations were located at the lagoon estuary of the Caspian Sea where the highest abundance of *Nereis* was found. *N. diversicolor* worms were collected using a Van Veen grab with 400 cm^2 cross section (20x20x10 cm) to determine biomass per square meter. Sediments were washed on a sieve (mesh size 0.5 mm) and the remaining matter on the sieve was collected in a plastic container and transferred to the laboratory where the live worms were separated. This procedure was repeated once every month through a period of one year. The worms were counted and divided into different weight classes and maintained to conduct experiments to determine their density for culture. Dissolved oxygen, water and air temperature, salinity and pH were recorded at the sampling site at each sampling.

At first about 3-50 *N. diversicolor* were placed in 1 L beakers containing 500 cm^3 of sediment collected from the sampling site with a surface area of 78.5 cm^2 and height of 6.5 cm. 500 cc of water was added to each beaker. The experiment was run with six trials (3, 9, 15, 25, 40 and 50 worms) using three replicates for each trial. Each worm was weighed prior to the experiment. No feed was given to the worms through the experiment period, however the worms fed on detritus found in the sediment. After one month the worms in each beaker were weighed again and their relative growth was calculated. The experiment was repeated using seven trials (3, 5, 7, 10, 15, 20 and 25 worms) under the same conditions.

RESULTS

Results obtained from the studies conducted on abundance of *N. diversicolor* in the Anzali Lagoon indicate that Class I (1-9 mg) of *N. diversicolor* that was found during five months of the year showed highest density in May (236 worms m^{-2}). Also density of *N. diversicolor* belonging to class II (11-50 mg) and class III (51-200 mg) showed highest density during April (113 worms m^{-2}) and May (127 worms m^{-2}), respectively. *N. diversicolor* of class IV (>200 mg) were found almost throughout the year except in October and November with the highest density of 92 worms m^{-2} in May.

Experiments on culture of *N. diversicolor* under experimental conditions showed that trial with 381 worms m^{-2} using three replicates under similar conditions showed increase in weight from 2.7 to 3.2 g whereas 0.5 g increase in weight was observed in trial using 3175 worms m^{-2}. Trials with higher densities showed negative growth as well as mortality.

In the second experiment also trials using 381 worms m^{-2} with three replicates under similar conditions showed increase in weight from 2.2 to 3.7 g and trials using 3175 worms m^{-2} showed weight gains of less than 0.5 g.

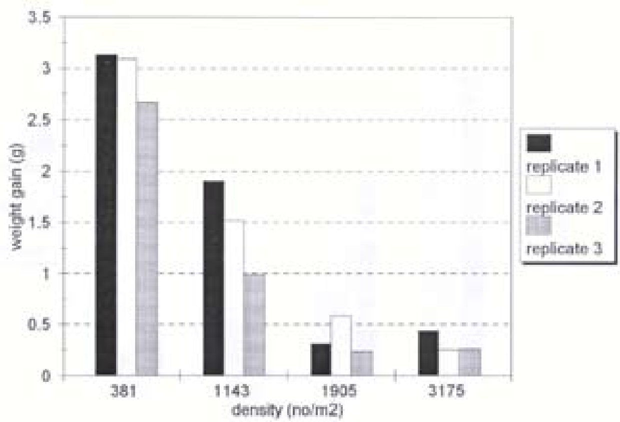

Figure 1. Stocking density of *Nereis diversicolor* in first experiment

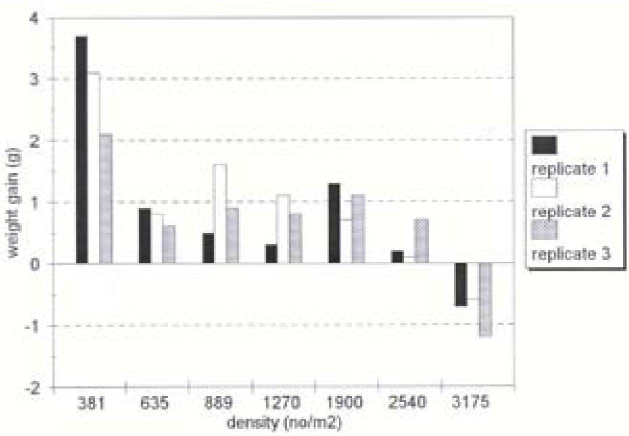

Figure 2: Stocking density of *Nereis diversicolor* in second experiment

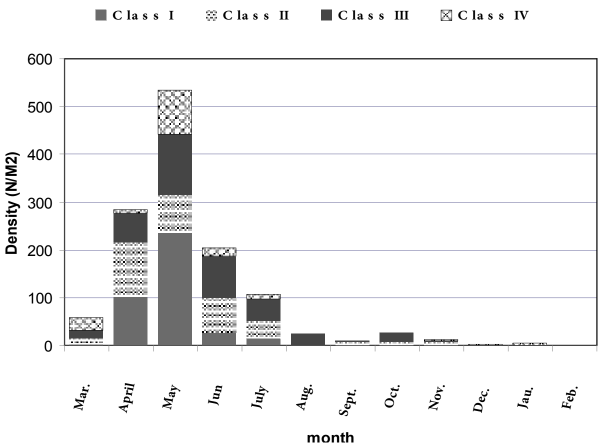

Figure 3. Density of *Neries diversicolor* in different weight classes in the lagoon estuary of Caspian Sea (March 2009-Febraury 2010)

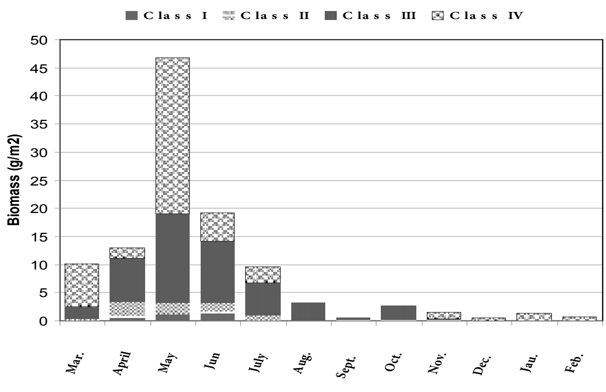

Figure 4. Biomass of *Neries diversicolor* in different weight classes in the lagoon estuary of Caspian Sea (March 2009-Febraury 2010)

DISCUSSION

The study of *Nereis diversicolor* in Anzali Lagoon indicate that this organisms can be a usefulness live food for economical Fish nutrition.

On the basis of results obtained it is evident that *N. diversicolor* occupies a wide area in the lagoon estuary of the Caspian Sea and are easily collected at 4.5 m depth. In the first experiment using six trials the density at the end of the experimental period was 381 worms m^{-2}, although negative growth rates were seen in trials 5 and 6 due to high stocking densities. In trials with lower stocking density, the *Nereis* worms not only showed increase in body weight without being fed diets but also showed no mortality. Trial number one in the first experiment showed the highest growth rates with an increase in biomass from 2.6 g m^{-2} to 3.3 g m^{-2} (Fig. 1). However increase in stocking density resulted in decrease in growth. As seen from results obtained in the second experiment it is clear that highest growth was obtained in trial using 381 worms m^{-2} (2-1-3.7 g). Trials with higher stocking density showed negative growth during the experimental period (Fig. 2).

In studies conducted in Gorgan Bay in 1964 the biomass of *N. diversicolor* was reported as 7 g m^{-2} (Ghasemov & Bagherov, 1983).

Results from studies conducted in the central region in the Sulak Bay indicate that *Nereis* worms are distributed at depths between 0.3 to 4 m in marshy sandy bottoms of this region with a biomass of 4.5 g m^{-2} (Latipov *et al*., 1994).

The biomass of *N. diversicolor* was reported as 0.01 g m^{-2} in 1995 in the Kura River. However in 1979 the biomass at 10 m depths was 0.8 g m^{-2} and in 1980 biomass in that region at similar depths was 1.17 g m^{-2} (Ghasemov, 1987).

Studies conducted to determine the density of *N. diversicolor* in the lagoon estuary of the Caspian Sea indicate that highest abundance in these worms is attained in May (Fig. 3). In February, only breeders of this species are found to remain in the environment that migrate to the deeper layers of the sediment and thus are not trapped in the Van veen grab.

Decrease in abundance in class I (1-9 mg) as compared to class II worms from July to December and again their increase from March to May indicate that the worms start breeding when temperature increases. Density of worms in their natural environments (447 m^{-2}) with that in the experimental medium (371 m^{-2}) were almost similar.

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